PB-240 316

BLACK LAKE, ST. LAWRENCE COUNTY, NEW YORK

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center, Corvallis
National Environmental Research Center, Las Vegas
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New York National Guard

December 1974

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

BLACK LAKE

ST. LAWRENCE COUNTY

NEW YORK

EPA REGION II

WORKING PAPER No. 148

WITH THE COOPERATION OF THE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AND THE

NEW YORK NATIONAL GUARD

DECEMBER, 1974

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the New York Department of Environmental Conservation for professional involvement and to the New York National Guard for conducting the tributary sampling phase of the Survey.

Henry L. Diamond, Commissioner of the New York Department of Environmental Conservation, and Leo J. Hetling, Director, and Italo G. Carcich, Senior Sanitary Engineer, Environmental Quality Research, Department of Environmental Conservation, provided invaluable lake documentation and counsel during the Survey.

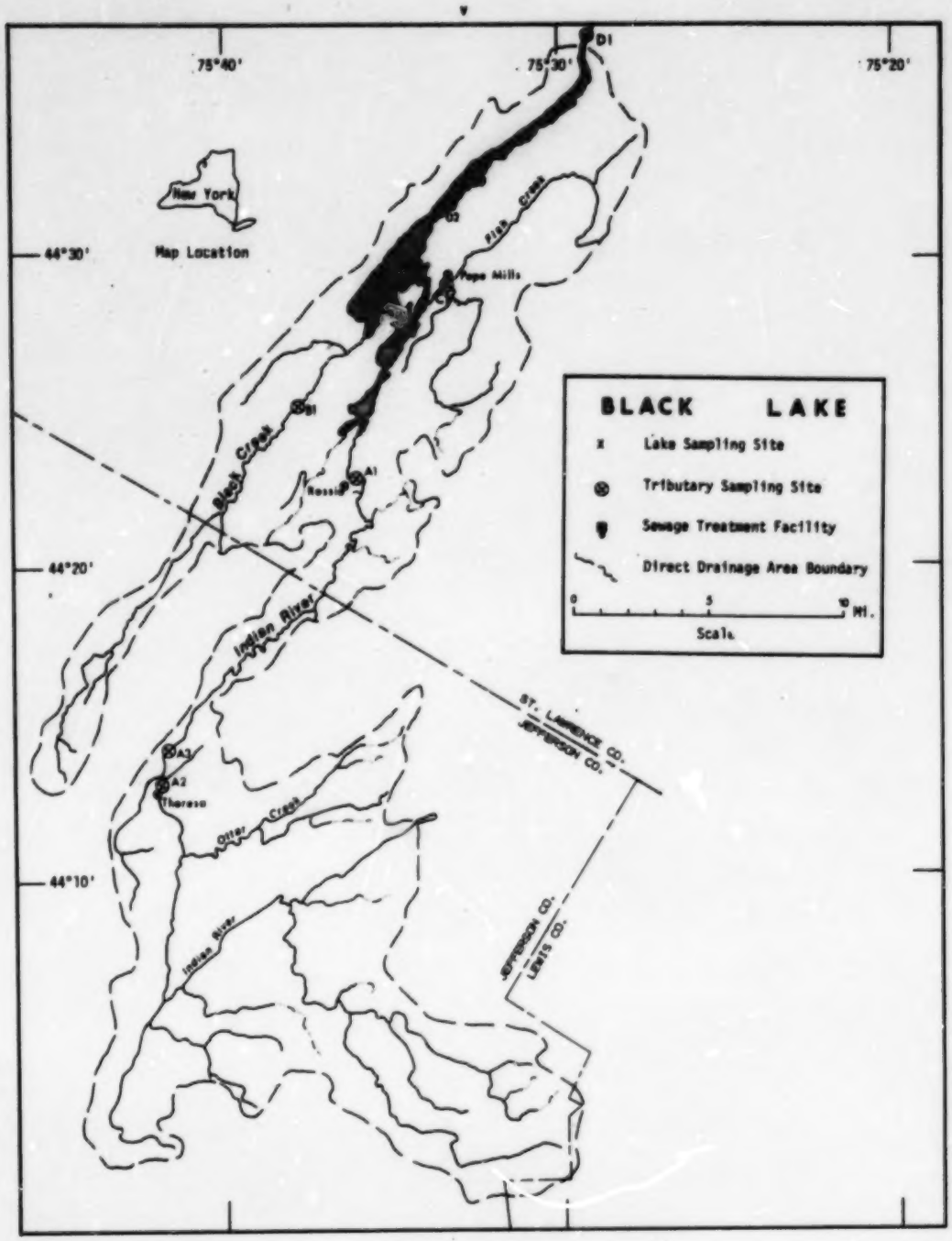
Major General John C. Baker, the Adjutant General of New York, and Project Officer Lieutenant Colonel Fred Peters, who directed the volunteer efforts of the New York National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW YORK

LAKE NAME	COUNTY
Allegheny Reservoir	Cattaraugas, NY; McLean, Warren, PA
Black	St. Lawrence
Canadaigua	Ontario
Cannonsville	Delaware
Carry Falls	St. Lawrence
Cassadaga	Chautauqua
Cayuga	Seneca, Tompkins
Champlain	Clinton, Essex, NY; Addison, Chittenden, Franklin, VT
Chautauqua	Chautauqua
Conesus	Livingston
Cross	Cayuga, Onondaga
Goodyear	Otsego
Huntington	Sullivan
Keuka	Ontario
Long	Hamilton
Lower St. Regis	Franklin
Otter	Cayuga
Owasco	Cayuga
Raquette Pond	Franklin
Round	Saratoga
Sacandaga Res.	Fulton, Saratoga
Saratoga	Saratoga
Schroon	Essex, Warren
Seneca	Seneca, Schyler, Yates
Swan	Sullivan
Swinging Bridge Res.	Sullivan


75°40'
75°30'
75°20'
44°30'
44°20'
44°10'
D1
D2
Flax Creek
Pope Mills
New York
Map Location
B1
Black Creek
Rossie
A1
Indian River
A3
A2
Theresa
Otter Creek
Indian River
ST. LAWRENCE CO.
JEFFERSON CO.
JEFFERSON CO.
LEWIS CO.
BLACK LAKE
Lake Sampling Site
Tributary Sampling Site
Sewage Treatment Facility
Direct Drainage Area Boundary
0
5
10 MI.
Scale

BLACK LAKE

STORET NO. 3602

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Black Lake is eutrophic. Of the 26 New York lakes surveyed in the fall of 1972, 12 had less mean total phosphorus, 18 had less mean dissolved phosphorus, and one had less mean inorganic nitrogen. For all New York data, 19 lakes had less mean chlorophyll a, and 19 had greater Secchi disc transparency.

B. Rate-Limiting Nutrient:

Algal assay results indicate that Black Lake was nitrogen limited in October when the sample was collected. The lake data indicate nitrogen limitation in July (N/P ratio was 4/1) but phosphorus limitation in May (N/P ratio was 22/1).

C. Nutrient Controllability:

1. Point sources--There were no known point sources of nutrients impacting Black Lake during the sampling year.

2. Non-point sources (see page 12)--The phosphorus exports of the Black Lake tributaries were about four times higher than the mean export of the tributaries to Carry Falls Reservoir* further east in St. Lawrence County. Also, the rather low N/P export ratios are indicative of unknown point sources.

* Working Paper No. 151.

The present phosphorus loading rate of 1.6 $g/m^2/yr$ is well above that proposed by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 12). Since there are no known point sources, control of non-point sources of phosphorus will be necessary to improve the existing trophic condition of Black Lake.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry:

1. Surface area: 8,352 acres†.
2. Mean depth: unknown.
3. Maximum depth: >16 feet.
4. Volume: unknown.
5. Mean hydraulic retention time: unknown.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Indian River	383.0 mi^2	652.9 cfs
Black Creek	56.6 mi^2	96.7 cfs
Fish Creek	63.3 mi^2	108.0 cfs
Minor tributaries & immediate drainage -	42.0 mi^2	94.1 cfs
Totals	544.9 mi^2	951.7 cfs

2. Outlet -

Unnamed Stream (to Oswegatchie River)	558.0 mi^2**	951.7 cfs

C. Precipitation***:

1. Year of sampling: 41.8 inches.
2. Mean annual: 35.6 inches.

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† Greeson and Robison, 1970.
* Drainage areas are accurate within ±5%, except for small basins (±10%); mean daily flows are accurate within ±5 to 25%; and normalized mean monthly flows are accurate within ±15%.
** Includes area of lake.
*** See Working Paper No. 1, "Survey Methods".

III. LAKE WATER QUALITY SUMMARY

Black Lake was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the two stations for phytoplankton identification and enumeration; and during the last visit, a single five-gallon depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 16 feet at station 1 and 9 feet at station 2.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake essentially was well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values. For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (10/10/72)		
Temperature (Cent.)	11.6	11.6	11.6	11.7
Dissolved oxygen (mg/l)	9.1	9.4	9.5	9.5
Conductivity (μmhos)	125	128	128	130
pH (units()	7.5	7.6	7.6	7.7
Alkalinity (mg/l)	55	56	56	57
Total P (mg/l)	0.026	0.030	0.030	0.036
Dissolved P (mg/l)	0.016	0.017	0.017	0.019
NO_2 + NO_3 (mg/l)	0.020	0.030	0.030	0.040
Ammonia (mg/l)	0.040	0.050	0.050	0.070
		ALL VALUES		
Secchi disc (inches)	66	73	69	78

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
05/20/72	1. Dinobryon	2,911
	2. Cryptomonas	416
	3. Fragilaria	344
	4. Cyclotella	289
	5. Synedra	253
	Other genera	669
	Total	4,882
07/25/72	1. Dinobryon	1,555
	2. Melosira	1,266
	3. Fragilaria	1,067
	4. Cryptomonas	361
	5. Cyclotella	307
	Other genera	778
	Total	5,334
10/10/72	1. Dinobryon	572
	2. Flagellates	338
	3. Stephanodiscus	187
	4. Melosira	66
	5. Oscillatoria	48
	Other genera	236
	Total	1,447

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/20/72	01	7.3
	02	37.3
07/25/72	01	8.7
	02	13.6
10/10/72	01	9.3
	02	2.1

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.021	0.092	2.2
0.050 P + 1.0 N	0.071	1.092	21.7
0.050 P + 10.0 N	0.071	10.092	20.6
1.0 N	0.021	1.092	3.0
10.0 N	0.021	10.092	3.2

2. Filtered and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.021	0.092	1.5
0.050 P + 1.0 N	0.071	1.092	18.0
0.050 P + 10.0 N	0.071	10.092	17.8
1.0 N	0.021	1.092	2.9
10.0 N	0.021	10.092	3.1

3. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Black Lake was moderately high at the time the sample was

collected. The response to the combined phosphorus and nitrogen spike, as well as the positive response to nitrogen alone, indicate that Black Lake was nitrogen limited at the time the sample was taken.

The lake data of the summer and fall sampling periods show low N/P ratios ranging from 1/1 to 5/1 (nitrogen limitation). The spring data show a N/P ratio of 22/1 (phosphorus limitation).

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the New York National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of April when two samples were collected. Sampling was begun in November, 1972, and was completed in October, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New York District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the nutrient loads, in $lbs/mi^2/year$, at station B-1 and multiplying by the ZZ area in mi^2.

There were no known point sources impacting Black Lake during the sampling year.

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* See Working Paper No. 1.

A. Waste Sources:

1. Known municipal - None

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Indian River	76,640	64.1
Black Creek	11,450	9.6
Fish Creek	21,640	18.1
b. Minor tributaries & immediate drainage (non-point load) -	8,480	7.1
c. Known municipal - None	-	-
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	1,300	1.1
Total	119,510	100.0

2. Outputs -

Lake outlet - Unnamed Stream 91,720

3. Net annual P accumulation - 27,790 pounds

* See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Indian River	1,413,820	66.6
Black Creek	172,530	8.1
Fish Creek	327,890	15.5
b. Minor tributaries & immediate drainage (non-point load) -	128,030	6.0
c. Known municipal - None	-	-
d. Septic tanks - None	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	80,460	3.8
Total	2,122,730	100.0

2. Outputs -

Lake outlet - Unnamed Stream 2,046,510

3. Net annual N accumulation - 76,220 pounds

* See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr	N/P Ratio
Indian River	200	3,691	18/1
Black Creek	202	3,048	15/1
Fish Creek	342	5,180	15/1

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	14.3	3.3	254.2	9.1
grams/m^2/yr	1.60	0.37	28.5	1.0

Vollenweider loading rates for phosphorus (g/m^2/yr) based on surface area and mean outflow of Black Lake:

"Dangerous" (eutrophic rate)	0.96
"Permissible" (oligotrophic rate)	0.48

V. LITERATURE REVIEWED

Greeson, Phillip E., and F. Luman Robison, 1970. Characteristics of New York lakes. Part 1 - Gazetteer of lakes, ponds, and reservoirs. Bull. 68, U.S. Dept. Int. and NY State Dept. of Env. Cons., Albany.

Vollenweider, Richard A. (in press). Input-output models. Schweiz. A. Hydrol.

VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEW YORK 11/26/74

LAKE CODE 3402 BLACK LAKE

TOTAL DRAINAGE AREA OF LAKE 558.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3402A1	383.00	667.00	656.00	1210.00	1690.00	808.00	426.00	274.00	217.00	249.00	384.00	611.00	695.00	652.91
3402B1	56.40	98.60	97.10	179.00	251.00	120.00	63.00	40.50	32.10	36.90	56.90	90.40	96.90	96.72
3402C1	63.30	110.00	109.00	200.00	280.00	134.00	70.40	45.30	35.90	41.30	63.60	101.00	108.00	108.04
3402D1	558.00	971.40	956.41	1758.91	2468.47	1179.27	620.62	398.75	315.80	363.77	559.65	890.45	954.41	951.68
3402ZZ	55.10	96.00	94.50	174.00	244.00	116.00	61.30	39.40	31.20	35.90	55.40	87.90	94.30	94.01

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 558.00
SUM OF SUB-DRAINAGE AREAS = 558.00

TOTAL FLOW IN = 11437.76
TOTAL FLOW OUT = 11437.89

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3402A1	11	72	110.00	4	395.00				
	12	72	1180.00	7	906.00				
	1	73	1510.00	21	935.00				
	2	73	1210.00	4	1530.00				
	3	73	1640.00	4	570.00				
	4	73	1480.00	1	860.00	19	1000.00	22	672.00
	5	73	1150.00	19	1220.00				
	6	73	540.00	15	490.00				
	7	73	258.00	15	25.40				
	8	73	201.00	25	145.00				
	9	73	272.00	8	182.00				
	10	73	309.00	14	214.00				
3402B1	11	72	163.00	4	87.90				
	12	72	175.00	7	201.00				
	1	73	223.00	21	207.00				
	2	73	179.00	4	336.00				
	3	73	243.00	4	125.00				
	4	73	219.00	1	140.00	19	163.00	22	115.00
	5	73	171.00	19	192.00				
	6	73	79.90	15	87.30				
	7	73	38.10	15	47.90				
	8	73	29.70	25	30.00				
	9	73	40.30	8	36.13				
	10	73	45.80	14	41.80				

51

TRIBUTARY FLOW INFONMATION FOR NEW YORK 11/26/74

LAKE CODE 3602 BLACK LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3602C1	11	72	182.00	4	33.90				
	12	72	195.00	7	77.30				
	1	73	249.00	21	79.50				
	2	73	201.00	4	132.00				
	3	73	271.00	4	48.50				
	4	73	244.00	1	71.00	19	84.00	22	56.00
	5	73	191.00	19	100.00				
	6	73	89.30	15	57.40				
	7	73	42.70	15	21.40				
	8	73	33.20	25	12.60				
	9	73	45.10	8	15.50				
	10	73	51.20	14	18.40				
360201	11	72	1610.00	4	866.00				
	12	72	1720.00	7	1980.00				
	1	73	2200.00	21	2040.00				
	2	73	1770.00	4	3320.00				
	3	73	2380.00	4	1240.00				
	4	73	2160.00	1	1380.00	19	1610.00	22	1130.00
	5	73	1690.00	19	1690.00				
	6	73	787.00	15	860.00				
	7	73	376.00	15	473.00				
	8	73	292.00	25	296.00				
	9	73	398.00	8	356.00				
	10	73	451.00	14	412.00				
3602Z2	11	72	58.00	4	85.50				
	12	72	170.00	7	195.00				
	1	73	217.00	21	201.00				
	2	73	175.00	4	328.00				
	3	73	236.00	4	122.00				
	4	73	213.00	1	136.00	19	159.00	22	112.00
	5	73	166.00	19	187.00				
	6	73	77.70	15	84.90				
	7	73	37.10	15	46.70				
	8	73	28.90	25	29.20				
	9	73	39.20	8	35.10				
	10	73	44.60	14	40.70				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/11/26

360201
44 29 05.0 075 37 25.0
BLACK LAKE
36031 NEW YORK

11EPALES
3

2111202
0015 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/20	15	08 0000	16.8	8.0	71	95	7.20	40	0.270	0.030	0.027	0.013
	15	08 0010	16.5	7.9		90	6.90	35	0.290	0.038	0.033	0.007
	15	08 0016	15.0	6.0		95	6.80	36	0.280	0.060	0.037	0.015
72/07/25	06	30 0000			66	130	7.90	55	0.050	0.130	0.050	0.049
	06	30 0004	25.0	6.4		130	7.80	55	0.050	0.120	0.051	0.040
72/10/10	09	20 0000			72	128	7.50	57	0.020	0.040	0.030	0.016
	09	20 0004	11.6	9.5		128	7.65	56	0.030	0.040	0.032	0.017
	09	20 0011	11.6	9.5		130	7.70	57	0.030	0.070	0.036	0.019

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/20	15	08 0000	7.3J
72/07/25	06	30 0000	8.7J
72/10/10	09	20 0000	9.3J

J= VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/11/26

360202
44 31 54.0 075 34 47.0
BLACK LAKE
36 NEW YORK

11EPALES
3

2111202
0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/20	16 15	0000	15.4	7.3	74	100	7.00	36	0.020	0.050	0.038	0.012
	16 15	0009	15.0	7.0		90	7.20	36	0.360	0.040	0.032	0.019
72/07/25	07 00	0000			72	125	7.80	53	0.040	0.090	0.037	0.029
	07 00	0004	25.6	6.8		125	7.70	53	0.060	0.100	0.050	0.030
72/10/10	09 40	0000			84	130	7.60	56	0.040	0.050	0.026	0.016
	09 40	0004	11.7	9.1		125	7.65	55	0.040	0.060	0.028	0.017

61

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/20	16 15	0000	37.3J
72/07/25	07 00	0000	13.6J
72/10/10	09 40	0000	2.1J

J VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY DATA

STORET RETRIEVAL DATE 74/11/26

3602A1 LS3602A1
44 25 30.0 075 39 30.0
INDIAN RIVER
36031 7.5 HAMMOND
I/BLACK LAKE
BRDG OFF ST HWY IN ROSSIE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	14 30		0.085	0.600	0.085	0.015	0.046
73/02/04	15 15		0.240	0.580	0.130	0.034	0.080
73/03/04	15 30		0.399	1.300	0.365	0.078	0.140
73/04/01	15 20		0.056	0.470	0.039	0.012	0.035
73/04/19	13 10		0.023	0.370	0.022	0.008	0.020
73/04/22	13 25		0.031	0.725	0.200	0.015	0.035
73/05/19	11 30		0.067	0.940	0.110	0.021	0.050
73/06/15			0.105	2.040	0.088	0.056	0.080
73/07/15			0.330	1.500	0.260	0.042	0.085
73/08/25	09 30		0.019	0.380	0.024	0.023	0.035
73/09/08	14 21		0.026	1.300	0.060	0.009	0.067
73/10/14	12 20		0.028	1.750	0.140	0.026	0.060

STORET RETRIEVAL DATE 74/11/26

3602A2 LS3602A2
44 13 00.0 075 47 30.0
INDIAN RIVER
36 7.5 THERESA
I/BLACK LAKE
BRDG IN THERESA ABOVE STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	09 15		0.117	0.700	0.075	0.022	0.056
72/12/19	13 20		0.154	0.420	0.037	0.008	0.022
73/01/21	13 30		0.310	0.750	0.113	0.029	0.070
73/03/27	10 30		0.110	0.380	0.031	0.008	0.030
73/04/12	13 00		0.069	0.310	0.021	0.007	0.020
73/04/26	16 00		0.063	0.440	0.030	0.017	0.040
73/05/10	11 05		0.072	0.440	0.035	0.012	0.030
73/05/31	14 15		0.064	1.200	0.040	0.036	0.065
73/06/26	10 30		0.132	0.680	0.021	0.017	0.050
73/07/15	13 10		0.038	1.540	0.050	0.010	0.030
73/08/18	08 25		0.011	0.820	0.029	0.009	0.032
73/09/16	11 00		0.082	0.880	0.052	0.017	0.035
73/10/14	13 50		0.082	3.000	0.185	0.013	0.035

STORET RETRIEVAL DATE 74/11/26

3602A3 LS3602A3
44 14 30.0 075 47 30.0
INDIAN RIVER
36 7.5 THERESA
I/BLACK LAKE
FROM DIRT RD 1.5 MI N THERESA BELOW STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	10 05		0.144	0.500	0.115	0.020	0.054
73/03/27	10 00		0.110	0.380	0.032	0.007	0.030
73/04/12	13 30		0.030	0.370	0.013	0.011	0.025
73/04/26	15 30		0.067	0.420	0.018	0.013	0.035
73/05/10	10 15		0.069	0.480	0.046	0.012	0.030
73/05/31	14 45		0.078	1.400	0.056	0.021	0.045
73/06/26	11 15		0.105	1.400	0.050	0.021	0.060
73/07/15	14 15		0.014	0.800	0.037	0.012	0.030
73/08/18	08 05		0.022	1.500	0.082	0.016	0.040
73/09/16	10 30		0.026	0.940	0.069	0.018	0.030
73/10/14	13 20		1.900	0.700	0.033		0.025

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STORET RETRIEVAL DATE 74/11/26

360281 LS360281
44 25 30.0 075 41 30.0
BLACK CREEK
36 7.5 HAMMOND
T/BLACK LAKE
ST HWY 185 BRDG 1.5 MI S OFHAMMOND
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	14 10		0.016	0.600	0.056	0.012	0.029
73/02/04	15 40		0.039	0.290	0.046	0.012	0.025
73/03/04	15 10		0.075	0.580	0.078	0.023	0.055
73/04/01	15 40		0.010K	0.500	0.038	0.008	0.025
73/04/19	13 00		0.010K	0.540	0.050	0.005K	0.020
73/04/22	13 00		0.010K	0.900	0.180	0.009	0.035
73/05/19	11 45		0.010K	0.910	0.105	0.026	0.040
73/06/15			0.010K	1.900	0.132	0.058	0.085
73/07/15			0.025	0.940	0.028	0.052	0.080
73/08/25	09 30		0.010K	0.600	0.040	0.063	0.115
73/09/08	14 47		0.032	1.260	0.069	0.012	0.065
73/10/14	12 00		0.010K	1.600	0.065	0.085	0.150

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K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3602C1 LS3602C1
44 29 00.0 075 35 00.0
FISH CREEK
36 7.5 POPE MILLS
T/BLACK LAKE
ST HWY 58 BRDG .25 MI S OFPOPE MILS
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	15 10		0.018	1.050	0.046	0.023	0.048
73/02/04	14 45		0.052	0.880	0.150	0.024	0.070
73/03/04	14 10		0.170	2.100	0.450	0.070	0.130
73/04/01	15 00		0.011	0.720	0.030	0.012	0.035
73/04/19	12 30		0.010K	0.690	0.066	0.005K	0.020
73/04/22	12 45		0.010K	0.880	0.006	0.020	0.050
73/05/19	11 00		0.012	1.320	0.029	0.030	0.060
73/06/15			0.012	3.000	0.095	0.110	0.170
73/07/15			0.600	1.890	0.075	0.154	0.220
73/09/08	14 00		0.023	0.980	0.023	0.009	0.075
73/10/14	12 00		0.010K	2.400	0.198	0.100	0.230

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3602D1 LS3602D1
44 37 00.0 075 28 30.0
UNNAMED OUTLET
36 7.5 HEUVELTON
O/BLACK LAKE
SPILE BRDG .75 MI SW OF LOST VILLAGE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	11 00		0.015	0.750	0.048	0.011	0.039
73/02/04	14 20		0.176	0.5[illegible]	0.069	0.022	0.070
73/03/04	14 00		0.189	0.[illegible]	0.130	0.027	0.055
73/04/01	14 00		0.085	0.56[illegible]	0.044	0.016	0.045
73/04/19	12 00		0.032	0.240	0.035	0.005K	0.035
73/04/22	12 00		0.010K	0.600	0.024	0.009	0.045
73/05/19	10 30		0.012	1.300	0.058	0.009	0.025
73/06/15			0.010K	1.470	0.050	0.017	0.040
73/07/15			0.076	0.690	0.015	0.027	0.035
73/08/25	08 00		0.010K	1.150	0.016	0.016	0.075
73/09/08	18 20		0.023	1.380	0.062	0.012	0.075
73/10/14	12 10		0.012	3.200	0.054	0.018	0.050

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K VALUE KNOWN TO BE
LESS THAN INDICATED